WATER RESOURCES REVIEW for

MARCH

1974

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANADA
DEPARTMENT OF THE ENVIRONMENT
INLAND WATERS BRANCH

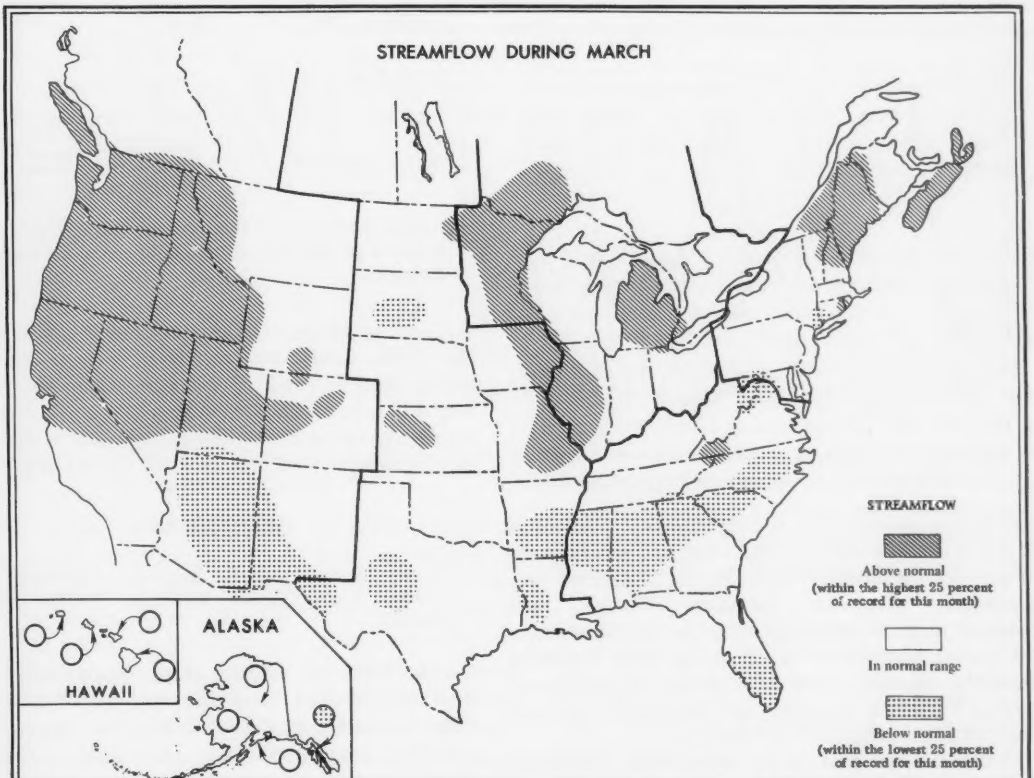
STREAMFLOW AND GROUND-WATER CONDITIONS

Streamflow generally decreased in the central and southeastern States and Alaska, and in much of southern Canada, but increased in most of the western and northeastern States and Hawaii, and in western British Columbia and the Atlantic Provinces in Canada.

Large areas of above-normal flow persisted in parts of northeastern, central, and western United States, and southern Canada. The combined flow of Mississippi, Columbia, and St. Lawrence Rivers, representing runoff from 1.7 million square miles in those areas, was about 40 percent greater than the normal flow for March.

Flows remained below normal in a large area in Arizona and western New Mexico, and in smaller areas in Texas and southeastern Alaska. Below-normal flows occurred also in parts of all the southern and southeastern States, from Louisiana to North Carolina.

Flooding occurred in parts of California, Oklahoma and Kansas.

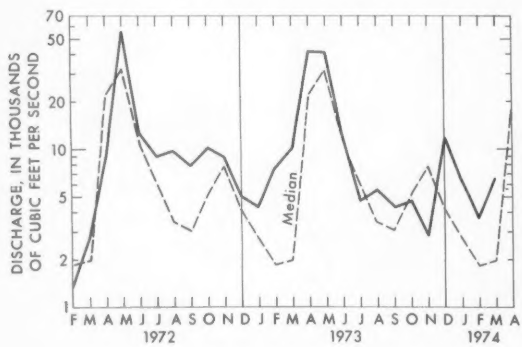


NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

STREAMFLOW INCREASED SEASONALLY IN MUCH OF THE REGION BUT DECREASED IN NEW BRUNSWICK AND IN PARTS OF QUEBEC AND MARYLAND. FLOWS REMAINED IN THE ABOVE-NORMAL RANGE IN SOUTHEASTERN QUEBEC, NORTHERN MAINE, AND CENTRAL NEW HAMPSHIRE, AND INCREASED INTO THAT RANGE IN NOVA SCOTIA, SOUTHERN MAINE, AND EASTERN CONNECTICUT.

Streamflow increased sharply in Nova Scotia as a result of several storms during the month and was 2 to 3 times the March medians in northern parts of the Province. In northern Maine, flow of St. John River below Fish River at Fort Kent also increased sharply, was nearly 3 times the median flow for March, and remained above the normal range for the 4th consecutive month (see graph). In central and southern Maine, where flows

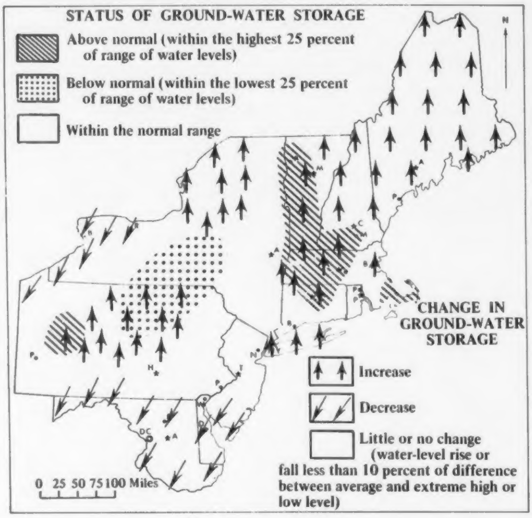


Monthly mean discharge of St. John River below Fish River, at Fort Kent, Maine. (Drainage area, 5,690 square miles.)

were in the normal range during February, streamflow increased into the above-normal range and generally was about twice the median flow for March. In adjacent New Hampshire, streamflow increased seasonally and remained in the above-normal range for the 4th consecutive month. Cumulative runoff during those 4 months (December–March) at the index station, Pemigewassett River at Plymouth, in central New Hampshire, was more than twice the median flow for that period.

In the southern part of the region, flow of Potomac River near Washington, D.C., increased sharply at monthend, but the monthly mean discharge of 11,500 cfs was only 55 percent of the median for March and below the normal range. Flow of Seneca Creek at Dawsonville in western Maryland, remained below median for the 2d consecutive month. In northwestern Pennsylvania, flow at the index station, Oil Creek at Rouseville, increased seasonally and was more than 3 times the below-normal flow of last month. In the central part of the State, flow of Susquehanna River at Harrisburg also increased seasonally but was less than the monthly median for the first time since April 1973.

Ground-water levels rose in most of New England and in central Pennsylvania, northeastern New York State, and on Long Island, N.Y. (see map). Levels generally



Map above shows ground-water storage near end of March and change in ground-water storage from end of February to end of March.

declined in Maryland, Delaware, and extreme western New York. Levels near monthend were in the above-normal range in much of central and southern New England and were below normal in south-central New York and north-central Pennsylvania. Elsewhere in the region, monthend levels were mostly in the normal range.

SOUTHEAST

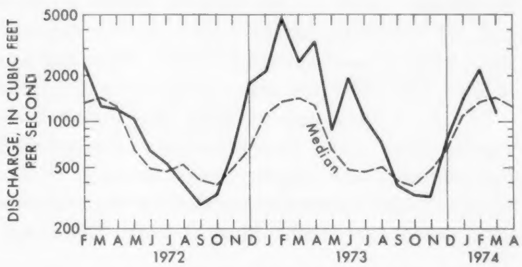
[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

STREAMFLOW GENERALLY DECREASED AND WAS BELOW THE NORMAL RANGE IN MUCH OF THE REGION. FLOWS INCREASED AND WERE NORMAL IN KENTUCKY AND WEST VIRGINIA, AND IN PARTS OF VIRGINIA AND FLORIDA, AND INCREASED INTO THE ABOVE-NORMAL RANGE IN EXTREME WESTERN VIRGINIA.

Flow of North Fork Holston River near Saltville, in southwestern Virginia, increased and was above the normal range, where it has been during 9 of the past 11

months. The cumulative runoff of 19.28 inches for the first half of the 1974 water year, October 1973 through March 1974, was nearly twice the median for that period. Maximum stages during March on this stream, and others in Virginia, were less than bankfull. In the adjacent States of West Virginia and Kentucky, where streamflow generally was below normal during February, flows increased into the normal range for March. Heavy rains in the Tug Fork and Guyandotte River basins in southern West Virginia caused sharp increases in flow but no flooding was reported.

In the southern part of the region, where monthly mean discharges at many index stations were 2 to 5 times medians during recent months, flows decreased sharply during March and generally were less than March medians. For example, monthly mean flow of Big Black River at Bovina, in west-central Mississippi (drainage area, 2,810 square miles) decreased from 24,600 cfs (534 percent of median) in January to 4,398 cfs (69 percent of median) in March. In the eastern part of the region, monthly mean flow of Lynches River at Effingham, South Carolina, decreased from the above-normal range (166 percent of median) during February, to 80 percent of median during March (see graph). In



Monthly mean discharge of Lynches River at Effingham, S.C.
(Drainage area, 1,030 square miles.)

north-central Florida and the adjacent areas of Alabama and Georgia, flow of Apalachicola River, as measured at Chattahoochie, Florida, decreased from the above-normal range (186 percent of median) during February into the normal range (64 percent of median) in March.

Also in north-central Florida, flow of Silver Springs increased 45 cfs, to 690 cfs; 91 percent of normal, and flow of Suwannee River at Branford increased seasonally but remained in the normal range for the 7th consecutive month. In the central and southern parts of the State, flows generally decreased and were below the normal range. Flow of Peace River at Arcadia was only 26 percent of the March median and cumulative runoff for the first half of 1974 water year was only 37 percent of median for that period. In southwestern Florida, flow southward through the Tamiami Canal outlets, 40-mile bend to Monroe, decreased to 0 cfs, and in the southeast, flow of Miami Canal at Miami decreased from 95 cfs during February to a monthly mean flow of 0.6 cfs during March; 0.3 percent of normal.

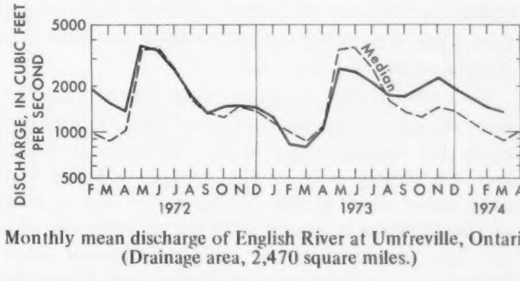
Ground-water levels rose slightly in Virginia and North Carolina, and rose also in most of Mississippi, Kentucky, and southern West Virginia. In other areas, levels generally declined, including Alabama, Florida, Georgia, and northern West Virginia. Monthend levels were near or above average in Kentucky, North Carolina, and southern West Virginia; near or below average in southeastern Florida; and below average also in northern West Virginia and in northern and central Florida. In south Dade County in southeastern Florida, ground-water levels were approaching sea level.

WESTERN GREAT LAKES REGION

[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

STREAMFLOW GENERALLY INCREASED SEASONALLY ACROSS THE CENTRAL PART OF THE REGION BUT DECREASED IN SOME BASINS IN ONTARIO, IN THE NORTH, AND INDIANA AND OHIO, IN THE SOUTH. FLOWS REMAINED ABOVE NORMAL IN PARTS OF ONTARIO, MINNESOTA, MICHIGAN, AND ILLINOIS.

High carryover flow from February, augmented by runoff from snowmelt or seasonal rains, held streamflow in the above-normal range in parts of Ontario, Minnesota, Michigan, and Illinois. Monthly mean flows of Rock River at Joslin, in northwestern Illinois, have been above the normal range for 15 consecutive months. Cumulative runoff at that site for the first half of the 1974 water year was more than twice the median runoff for that period. In southwestern Ontario, monthly mean discharge of English River at Umfreville decreased seasonally but remained above median for the 8th consecutive month (see graph). Cumulative runoff at that site



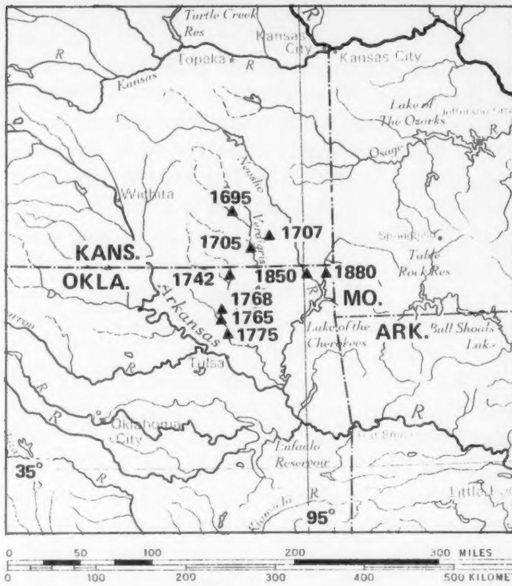
Monthly mean discharge of English River at Umfreville, Ontario.
(Drainage area, 2,470 square miles.)

during the first six months of the 1974 water year was above the normal range. In southern Michigan,

streamflow increased seasonally and remained in the above-normal range, where it has been for the past 4 months.

In north-central Illinois, and the adjacent area of south-central Wisconsin, flow of Pecatonica River, as measured at Freeport, Illinois, ended a 19-month period in the above-normal range. Cumulative runoff at that site during the first half of the 1974 water year was more than twice the 6-month median.

Ground-water levels rose in Wisconsin, southern Minnesota, and in Michigan's Upper Peninsula; changed only slightly in Ohio; and declined in northern Michigan and Minnesota. Levels near monthend were above average in northern Minnesota and in Michigan (highest for March in 25 years in an observation well in the southern part of the State); were near average in Ohio; and remained below average in southern Minnesota. In wells tapping artesian aquifers underlying the Minneapolis-St. Paul, Minn., area, levels changed only slightly and remained below average.



Locations of stream-gaging stations described in table of peak stages and discharges on page 5.

MIDCONTINENT

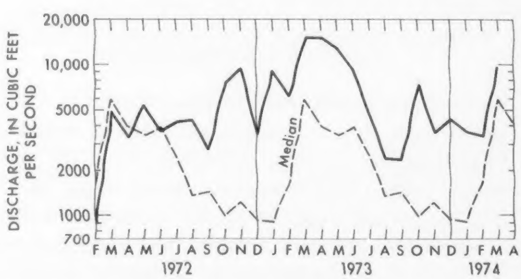
[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

STREAMFLOW DECREASED AND WAS IN THE NORMAL RANGE IN MUCH OF THE REGION. FLOWS WERE ABOVE NORMAL IN PARTS OF NORTH DAKOTA, IOWA, MISSOURI, AND KANSAS, AND WERE BELOW NORMAL IN PARTS OF SOUTH DAKOTA, TEXAS, LOUISIANA, AND ARKANSAS. FLOODING OCCURRED IN NORTHEASTERN OKLAHOMA AND THE ADJACENT AREA OF SOUTHEASTERN KANSAS. AT BATON ROUGE, LOUISIANA, THE MISSISSIPPI RIVER REMAINED BELOW FLOOD STAGE DURING THE ENTIRE MONTH BUT WAS RISING AT MONTHEND.

Major flooding occurred March 10–13 along Verdigris and Neosho Rivers, and their tributaries, in northeastern Oklahoma and southeastern Kansas. The peak stage and discharge on Bird Creek near Avant, Oklahoma, were the highest in 28 years of record. Selected data on stages, discharges, and gaging-station locations are given on the accompanying table and map.

In central Kansas, monthly mean flow of Saline River near Russell decreased contraseasonally but remained above the normal range for the 7th consecutive month and was nearly 6 times the median flow for March. Cumulative runoff at that site during the first six months of the 1974 water year was almost 10 times the median for that period. Similarly, flow of Elkhorn River at Waterloo, in northeastern Nebraska, and Grand River near Gallatin, in northwestern Missouri, decreased contraseasonally during March, and the cumulative runoff at those sites since October 1, 1973 was several times the median runoff for the 6-month period. At monthend, all reservoirs, except Enders, in the Republican River basin in southwestern Nebraska, were filled to the tops of their respective conservation (irrigation) pools.

In eastern Iowa, high carryover flow from February, augmented by runoff from snowmelt and nearly-normal precipitation, held monthly mean discharge of Cedar River at Cedar Rapids above median for the 21st consecutive month (see graph). Flow at Cedar Rapids was in



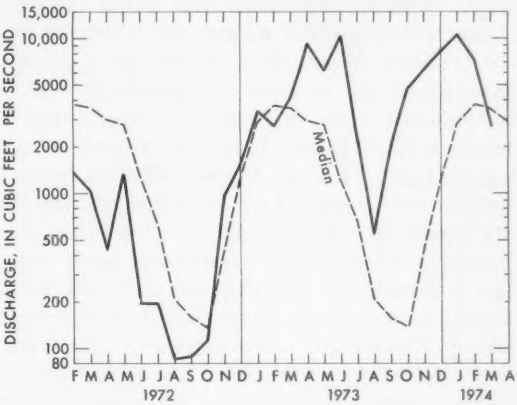
Monthly mean discharge of Cedar River at Cedar Rapids, Iowa. (Drainage area, 6,510 square miles.)

the above-normal range during 20 of those 21 months. Elsewhere in the State, March mean flows of Nishnabotna River above Hamburg, in the southwest, and Winnebago River at Mason City, in north-central

Iowa, remained above the normal range and were roughly twice their respective medians for the month. Also as a result of high carryover flow, plus snowmelt runoff, monthly mean discharge of Red River of the North at Grand Forks, North Dakota, remained above the normal range for the 7th consecutive month. Cumulative runoff during the first half of the 1974 water year was almost 4 times median runoff for the 6-month period, at that site.

In the southern part of the region, flows in southern Arkansas and southern Louisiana decreased into the below-normal range. At the index station Calcasieu River near Oberlin, in southwestern Louisiana, where the monthly mean discharge was 5,637 cfs (308 percent of median) during January, the mean flow during March was 492 cfs (28 percent of median for the month). Similarly, at the index station, Saline River near Rye, in southeastern Arkansas, where mean flow during December was 12,775 cfs (1,110 percent of median), monthly mean discharge during March was only 3,401 cfs (73 percent of median).

In Texas, flows at all index stations decreased, except on North Concho River near Carlsbad, where monthly mean flow has been 0 cfs for 8 consecutive months. In the east-central part of the State, monthly mean flow of Neches River near Rockland decreased and was below the median for March, ending an 11-month period of above-normal flows (see graph). In the El Paso



Monthly mean discharge of Neches River near Rockland, Texas. (Drainage area, 3,637 square miles.)

Provisional data; subject to revision

STAGES AND DISCHARGES FOR THE FLOODS OF MARCH 1974 AT SELECTED SITES IN KANSAS AND OKLAHOMA

WRD station number	Stream and place of determination	Drainage area (square miles)	Period of known floods	Maximum flood previously known			Maximum during present flood				
				Date	Stage (feet)	Discharge (cfs)	Date	Stage (feet)	Discharge		Recurrence interval (years)
									Cfs	Cfs per square mile	
	KANSAS										
ARKANSAS RIVER BASIN											
7-1695	Fall River at Fredonia	827	1904–	Apr. 16, 1945	36.17	49,000	Mar. 11	24.78	14,000	16.9	(a)
7-1705	Verdigris River at Independence.	2,892	1921–	Apr. 17, 1945	47.28	117,000	11	39.45	36,000	12.5	(a)
7-1707	Big Hill Creek near Cherrydale.	37	1957–	July 5, 1967	18.00	5,030	10	19.8	12,000	324	(a)
	OKLAHOMA										
7-1742	Little Caney Creek below Cotton Creek near Copan.	502	1958–	May 9, 1961	24.94	23,700	Mar. 10	25.28	24,000	47.8	8
7-1765	Bird Creek near Avant	364	1945–	Oct. 2, 1959	31.40	32,400	11	32.00	34,000	93.5	30
7-1768	Candy Creek near Wolco ..	30.6	1969–	July 3, 1972	17.31	8,510	10	19.5	[b]10,000	327	50
7-1775	Bird Creek near Sperry ...	905	1938–	Oct. 3, 1959	32.60	90,000	12	30.73	46,000	50.8	40
7-1850	Neosho River near Commerce.	5,876	1939–	July 15, 1951	34.03	267,000	12	22.42	80,000	136	15
7-1880	Spring River near Quapaw..	2,510	1939–	May 19, 1943	43.4	190,000	12	30.20	76,000	30.3	15

[a]Not determined.
[b]About.

area of extreme western Texas, climatic conditions during the past fall and winter months were reported to have been the driest since 1879.

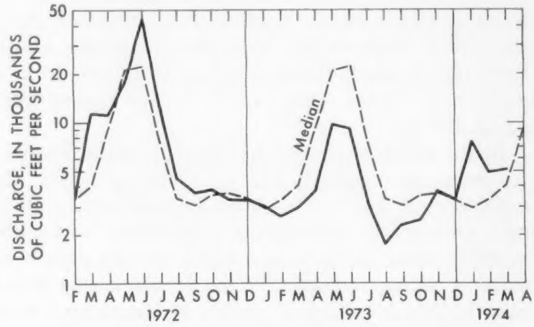
Ground-water levels generally rose in North Dakota, Iowa, Nebraska, Oklahoma, and central Louisiana; changed only slightly in Kansas; and declined in southern Louisiana. Monthend levels were above average in Nebraska (except in areas of extensive ground-water development), Iowa, and central Louisiana; and near average in North Dakota. In the Chicot aquifer of southwestern Louisiana, levels declined and were lowest for March in the 34 years of record, leading into the irrigation season. In Arkansas, levels in the east-central rice growing area were relatively unchanged in the shallow aquifer (Quaternary deposits) and continued seasonal rises in the deep aquifer (Sparta Sand). In the industrial aquifer of central and southern Arkansas (Sparta Sand), levels declined to a new alltime low at Pine Bluff and rose to slightly above average at El Dorado. In Texas, levels rose in the Evangeline aquifer in the Houston area; rose slightly in the Edwards Limestone at Austin and in the bolson deposits at El Paso; and declined in the Edwards Limestone at San Antonio. Monthend levels were above average in Austin (highest for March in the 30 years of record) and San Antonio; and lowest of record for March at El Paso and Houston.

WEST

[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

STREAMFLOW GENERALLY INCREASED THROUGHOUT THE REGION, WAS ABOVE THE NORMAL RANGE IN THE NORTHWEST STATES AND VANCOUVER ISLAND, AND BELOW THAT RANGE IN WESTERN NEW MEXICO AND MOST OF ARIZONA. MINOR FLOODING OCCURRED IN PARTS OF NORTHERN CALIFORNIA.

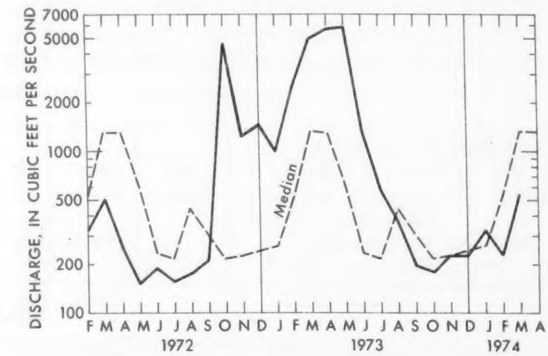
In northern California, runoff from fairly heavy rains during the last few days of the month caused minor flooding along the Eel and Russian Rivers. At the index stream-gaging stations, Smith River near Crescent City and North Fork American River at North Fork Dam, also in the northern part of the State, monthly mean flows increased contraseasonally, were above the normal range, and were more than twice their respective medians for the month. A similar pattern of above-normal, and increasing, flows occurred on Vancouver Island, British Columbia, and in parts of Washington, Oregon, Idaho, Montana, Nevada, and Utah. Flow of Clark Fork at St. Regis, in western Montana, was typical of March flows at most index stations in those States (see graph). Monthend high-elevation snowpack was above average in



Monthly mean discharge of Clark Fork at St. Regis, Mont. (Drainage area, 10,709 square miles.)

Idaho and normal at Norden, on the summit of the Sierra Nevada, in northeastern California.

In the southern part of the region, monthly mean flows at the index stations on Gila River in New Mexico (at Gila) and Arizona (near Solomon), were only 20 and 29 percent of median for March, respectively. In the adjacent basin of Salt River, the monthly mean flow of 544 cfs at the index station near Roosevelt, Arizona was 41 percent of median (see graph). In northwestern Arizona, and the adjacent area of southwestern Utah, flow of Virgin River, as measured at Littlefield, Arizona, was only 69 percent of median for March.



Monthly mean discharge of Salt River near Roosevelt, Ariz. (Drainage area, 4,306 square miles.)

In northern Utah, the level of Great Salt Lake rose 0.50 foot during the month (to 4,200.80 feet above mean sea level), 0.50 foot higher than a year ago, and 2.10 feet higher than the average (1904–72) monthly level for March. In west-central Utah, flow was diverted from Sevier River to Sevier Lake during March. This is the first significant inflow to the lake since 1922 and

Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF MARCH 1974

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Feb. 1974	End of Mar. 1974	End of Mar. 1973	Average for end of Mar.	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	59	75	76	62	223,400 (a)
QUEBEC					
Gouin (P)	65	56	51	43	10,865 ac-ft
Allard (P)	69	57	64	29	438 ac-ft
MAINE					
Seven reservoir systems (MP)	62	61	63	32	178,489 mcf
NEW HAMPSHIRE					
Lake Winnipesaukee (PR)	61	76	83	61	7,200 mcf
Lake Francis (FPR)	33	36	28	18	4,326 mcf
First Connecticut Lake (P)	26	23	18	14	3,330 mcf
VERMONT					
Somerset (P)	66	63	64	50	2,500 mcf
Harriman (P)	38	52	46	32	5,060 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	80	86	86	76	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	38	57	87	45	34,270 mcf
Indian Lake (FMP)	45	43	68	47	4,500 mcf
New York City reservoir system (MW)	98	99	100	......	547,500 mg
NEW JERSEY					
Wanaque (M)	97	100	100	87	27,730 mg
PENNSYLVANIA					
Wallenpaupack (P)	60	54	64	64	6,875 mcf
Pymatuning (FMR)	82	96	95	93	8,191 mcf
MARYLAND					
Baltimore municipal system (M)	99	97	101	91	85,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	96	90	99	89	12,580 mcf
High Rock Lake (P)	75	62	100	84	10,230 mcf
Narrows (Badin Lake) (P)	99	97	100	101	5,616 mcf
SOUTH CAROLINA					
Lake Murray (P)	83	84	89	76	70,300 mcf
Lakes Marion and Moultrie (P)	93	83	93	79	81,100 mcf
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	70	73	77	71	75,360 mcf
GEORGIA					
Burton (PR)	75	92	92	83	104,000 ac-ft
Lake Sidney Lanier (FMPR)	64	63	63	57	1,686,000 ac-ft
Sinclair (MPR)	92	87	87	90	214,000 ac-ft
ALABAMA					
Lake Martin (P)	85	81	98	89	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	48	61	64	49	1,156,000 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	54	66	74	54	1,452,000 cfsd
Douglas Lake (FPR)	23	42	62	42	703,100 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	57	62	68	63	512,200 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	60	64	76	62	745,200 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	39	36	69	24	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	12	18	79	25	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	25	24	22	18	1,640,000 ac-ft
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	83	83	90	......	22,640,000 ac-ft
NEBRASKA					
Lake McConaughy (IP)	81	81	84	76	1,948,000 ac-ft
OKLAHOMA					
Keystone (FPR)	109	150	207	103	661,000 ac-ft
Lake O' The Cherokees (FPR)	86	111	125	85	1,492,000 ac-ft
Tenkiller Ferry (FPR)	106	112	143	87	628,200 ac-ft
Lake Altus (FIMR)	50	54	24	52	134,500 ac-ft
Eufaula (FPR)	102	108	131	80	2,378,000 ac-ft
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	101	102	106	87	2,722,000 ac-ft
TEXAS					
Possum Kingdom (IMPRW)	81	80	94	76	724,500 ac-ft
Buchanan (IMPW)	82	82	76	77	955,200 ac-ft
Bridgeport (IMW)	52	52	55	43	386,400 ac-ft
Eagle Mountain (IMW)	96	93	94	85	190,300 ac-ft
Medina Lake (I)	99	98	95	48	254,000 ac-ft
Lake Travis (FIMPRW)	100	100	103	78	1,144,000 ac-ft
Lake Kemp (IMW)	59	60	44	75	319,600 ac-ft
THE WEST					
ALBERTA					
Spray (P)	....	....	35	21	210,000 ac-ft
Lake Minnewanka (P)	....	....	51	33	199,700 ac-ft
St. Mary (I)	....	71	70	68	320,800 ac-ft
WASHINGTON					
Franklin D. Roosevelt Lake (IP)	22	37	35	50	5,232,000 ac-ft
Lake Chelan (PR)	33	23	17	31	676,100 ac-ft
IDAHO--WYOMING					
Upper Snake River (7 reservoirs) (IMP)	73	67	74	78	4,282,000 ac-ft
WYOMING					
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	75	71	67	43	3,056,200 ac-ft
Buffalo Bill (IP)	44	41	53	61	421,300 ac-ft
Boysen (FIP)	83	76	62	61	802,000 ac-ft
Keyhole (F)	82	84	84	38	199,900 ac-ft
COLORADO					
John Martin (FIR)	7	9	6	21	364,400 ac-ft
Colorado–Big Thompson project (I)	82	82	72	54	722,600 ac-ft
Taylor Park (IR)	60	60	38	57	106,000 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Navajo, and Blue Mesa Reservoirs (IFPR)	70	71	52	......	31,276,500 ac-ft
UTAH--IDAHO					
Bear Lake (IPR)	77	77	75	57	1,421,000 ac-ft
CALIFORNIA					
Hetch Hetchy (MP)	48	45	14	26	360,400 ac-ft
Lake Almanor (P)	98	102	69	48	1,036,000 ac-ft
Shasta Lake (FIPR)	81	96	89	84	4,377,000 ac-ft
Millerton Lake (FI)	95	90	96	62	503,200 ac-ft
Pine Flat (FI)	69	75	56	52	1,014,000 ac-ft
Isabella (FIR)	45	40	16	23	551,800 ac-ft
Folsom (FIP)	61	77	62	60	1,000,000 ac-ft
Lake Berryessa (FIMW)	101	102	101	88	1,600,000 ac-ft
Clair Engle Lake (Lewiston) (P)	98	97	87	87	2,438,000 ac-ft
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	81	84	73	56	744,600 ac-ft
NEVADA					
Rye Patch (I)	79	97	104	......	157,200 ac-ft
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	77	75	77	62	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	54	50	69	18	1,093,000 ac-ft
Salt and Verde River system (IMPR)	73	73	93	46	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	71	71	63	77	352,600 ac-ft
Elephant Butte and Caballo (FIPR)	37	34	18	28	2,539,000 ac-ft

[a] Thousands of kilowatt-hours

METRIC EQUIVALENTS OF UNITS USED IN THE WATER RESOURCES REVIEW

(Round-number conversions, to nearest four significant figures)

1 foot = 0.3048 meter   1 mile = 1.609 kilometers
1 acre = 0.4047 hectare = 4,047 square meters
1 square mile = 259 hectares = 2.59 square kilometers
1 acre-foot (ac-ft) = 1,233 cubic meters
1 million cubic feet (mcf) = 28,320 cubic meters

1 cubic foot per second (cfs) = 0.02832 cubic meters per second = 1.699 cubic meters per minute
1 second-foot-day (cfsd) = 2,447 cubic meters per day
1 million gallons (mg) = 3,785 cubic meters = 3.785×10^6 liters
1 million gallons per day (mgd) = 694.4 gallons per minute (gpm) = 2.629 cubic meters per minute = 3,785 cubic meters per day

FLOW OF LARGE RIVERS DURING MARCH 1974

Station number	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1970 (cfs)	March 1974 Monthly discharge (cfs)	Percent of median monthly 1941–70	Change in discharge from previous month (percent)	Discharge near end of month (cfs)	(mgd)	Date
1–0140	St. John River below Fish River at Fort Kent, Maine.	5,690	9,397	6,469	274	+79	5,800	3,700	31
1–3185	Hudson River at Hadley, N.Y	1,664	2,791	4,469	151	+44	2,200	1,400	31
1–3575	Mohawk River at Cohoes, N.Y	3,456	5,450	9,930	93	+65	5,000	3,200	31
1–4635	Delaware River at Trenton, N.J	6,780	11,360	18,938	96	+21	19,800	12,800	27
1–5705	Susquehanna River at Harrisburg, Pa.	24,100	33,670	56,190	77	+31	34,100	22,000	28
1–6465	Potomac River near Washington, D.C.	11,560	[1] 10,640	11,500	55	+2	30,700	19,800	31
2–1055	Cape Fear River at William O. Huske Lock near Tarheel, N.C.	4,810	4,847	4,120	46	-61	4,500	2,800	31
2–1310	Pee Dee River at Peedee, S.C	8,830	9,098	11,000	78	-52	9,330	6,000	27
2–2260	Altamaha River at Doctortown, Ga.	13,600	13,380	21,050	82	-34	13,700	8,900	27
2–3205	Suwannee River at Branford, Fla	7,740	6,775	6,090	62	+8	4,910	3,200	23
2–3580	Apalachicola River at Chattahoochee, Fla.	17,200	21,690	24,700	64	-55	24,900	16,100	27
2–4670	Tombigbee River at Demopolis lock and dam near Coatopa, Ala.	15,400	21,700	30,750	63	-63	39,800	25,700	25
2–4895	Pearl River near Bogalusa, La	6,630	8,533	17,070	98	-63	9,200	5,900	26
3–0495	Allegheny River at Natrona, Pa	11,410	[1] 18,700	40,380	111	+75	25,600	16,500	28
3–0850	Monongahela River at Braddock, Pa.	7,337	[1] 11,950	18,260	86	+29	12,100	7,800	28
3–1930	Kanawha River at Kanawha Falls, W.Va.	8,367	12,370	24,600	110	+48	18,100	11,700	26
3–2345	Scioto River at Higby, Ohio	5,131	4,337	5,529	62	-25	4,600	3,000	27
3–2945	Ohio River at Louisville, Ky[2]	91,170	110,600	231,500	105	+53	199,800	129,100	27
3–3775	Wabash River at Mount Carmel, Ill.	28,600	26,310	63,890	127	-9	40,200	26,000	31
3–4690	French Broad River below Douglas Dam, Tenn.	4,543	[1] 6,528	12,330	113	-17	....	....	....
4–0845	Fox River at Rapide Croche Dam, near Wrightstown, Wis.[2]	6,150	4,142	5,200	122	-6	....	....	....
4–2643.31	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y.[3]	299,000	239,100	301,600	130	+14	310,000	200,400	31
5–0825	Red River of the North at Grand Forks N. Dak.	30,100	2,439	2,275	144	+14	3,500	2,300	31
5–3300	Minnesota River near Jordan, Minn ..	16,200	3,306	4,380	155	+271	3,660	2,400	28
5–3310	Mississippi River at St. Paul, Minn ...	36,800	[1] 10,230	12,690	168	+96	11,300	7,300	27
5–3655	Chippewa River at Chippewa Falls, Wis.	5,600	5,062	4,679	109	+29	....	....	....
5–4070	Wisconsin River at Muscoda, Wis	10,300	8,457	10,230	113	+55	....	....	....
5–4465	Rock River near Joslin, Ill	9,520	5,288	17,960	186	+40	11,600	7,500	31
5–4745	Mississippi River at Keokuk, Iowa ...	119,000	61,210	112,000	133	+51	91,500	59,100	31
5–4905	Des Moines River at Keosauqua, Iowa.	14,038	5,220	13,700	183	+49	8,040	5,200	31
6–2145	Yellowstone River at Billings, Mont.	11,795	6,754	2,845	96	+8	2,900	1,900	31
6–9345	Missouri River at Hermann, Mo	528,200	78,480	129,100	176	+10	107,000	69,200	25
7–2890	Mississippi River near Vicksburg, Miss.[4]	1,144,500	552,700	1,098,000	135	-20	1,213,000	784,000	25
9–3150	Green River at Green River, Utah ...	40,600	6,369	6,813	175	+72	4,660	3,000	27
9–4025	Colorado River near Grand Canyon, Ariz.	137,800	....	6,590	......	+12	....	....	....
11–4255	Sacramento River at Verona, Calif ...	21,257	18,370	54,710	178	+22	50,220	32,400	27
13–2690	Snake River at Weiser, Idaho	69,200	17,670	39,110	223	+71	43,500	28,100	26
13–3170	Salmon River at White Bird, Idaho ..	13,550	11,060	7,823	154	+24	8,050	5,200	26
13–3425	Clearwater River at Spalding, Idaho ..	9,570	15,320	28,810	231	+23	27,700	17,900	26
14–1057	Columbia River at The Dalles, Oreg.[5]	237,000	194,000	223,000	162	-7	....	....	....
14–1910	Willamette River at Salem, Oreg	7,280	23,370	49,030	166	+4	31,480	20,300	27–31
15–5155	Tanana River at Nenana, Alaska	25,600	24,040	4,096	68	-18	4,000	2,600	31
8MF005	Fraser River at Hope, British Columbia.	78,300	95,300	32,900	118	-1	39,700	25,700	31

[1] Adjusted.
[2] Records furnished by Corps of Engineers.
[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

only the 3d time since that year that diverted water has even reached the lake.

The pattern of monthend reservoir storage throughout the region was variable. Contents of the Colorado River Storage Project increased 335,000 acre-feet during the month. The combined contents of Lakes Mead and Mohave was 21 percent greater than the 38-year average and 3 percent less than a year ago. Monthend contents of major reservoirs in northern California averaged 24 percent above average, which assures adequate water for the coming summer. In Idaho, water is being released from flood-control reservoirs; above-average spring runoff has been forecast for most basins, provided that precipitation is normal.

Ground-water levels rose in most of Utah, northern Idaho, and western Washington; changed only slightly in much of southern California and southern New Mexico; and generally declined in southern Arizona, southern Idaho, and eastern Washington. Monthend levels were above average in Washington and Idaho (except in the Rupert-Minidoka area); near average in southern California; and below average in most of southern Arizona and New Mexico.

ALASKA

Streamflow decreased seasonally in all parts of the State, remained below normal in Gold Creek basin, in the southeast, for the 5th consecutive month, and in Tanana River basin, in the interior, for the 3d consecutive month; and was in the normal range elsewhere. At the index station on Tanana River at Nenana (drainage area, 25,600 square miles), the monthly mean discharge of 4,096 cfs, and the daily mean of 4,000 cfs March 11–31, were lowest for the month in record that began in 1963. This is the 3d consecutive month of record-low daily minimum flows at Nenana. Cumulative runoff during the first half of 1974 water year at all index stations in the State, was less than median, but the rate of recession during the winter months generally was less than usual because of above-normal temperatures.

Ground-water levels in the Kenai Peninsula and in the artesian system near Anchorage continued to decline seasonally. There was little or no change in levels in the unconfined aquifer in the Anchorage area.

HAWAII

Streamflow generally increased seasonally in all parts of the State, but decreased on Oahu, and was below median for March at all index stations except Waiakea Stream near Mountain View, Hawaii, where flow during March was 34 percent greater than median for the month. Cumulative runoff during the first half of the 1974 water year was above median on the island of Kauai, but was less than the cumulative median at index stations on Maui, Oahu, and Hawaii, and was in the normal range throughout the State.

WATER RESOURCES REVIEW **MARCH 1974**

Cover map shows generalized pattern of streamflow for March based on 22 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for March 1974 is compared with flow for March in the 30-year reference period 1931–60 or 1941–70. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for March is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being within the *normal range*. In the Water Resources Review the median is obtained by ranking the 30 flows of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median.

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the March flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of March. Water level in each key observation well is compared with average level for the end of March determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels*, unless described otherwise, are from the end of February to the end of March.

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This issue was prepared by J.C. Kammerer, H.D. Brice, T.H. Woodard and L.C. Fleshmon from reports of the field offices, April 9, 1974.

CHARACTERISTICS OF WATER QUALITY AND STREAMFLOW, PASSAIC RIVER BASIN ABOVE LITTLE FALLS, NEW JERSEY

The accompanying abstract and graph are from the report, *Characteristics of water quality and streamflow, Passaic River basin above Little Falls, New Jersey*: U.S. Geological Survey Water-Supply Paper 2026, 80 pages, 1973; prepared in cooperation with the State of New Jersey, Department of Environmental Protection, and the Passaic Valley Water Commission. The report may be purchased for $0.70 from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 (GPO Stock Number 2401-02371).

ABSTRACT

The findings of a problem-oriented river-system investigation of the water-quality and streamflow characteristics of the Passaic River above Little Falls, N.J. (drainage area 762 sq mi) are described. Information on streamflow duration, time-of-travel measurements, and analyses of chemical, biochemical, and physical water quality are summarized. This information is used to define relations between water quality, streamflow, geology, and environmental development in the basin's hydrologic system. The existence, nature, and magnitude of long-term trends in stream quality—as measured by dissolved solids, chloride, dissolved oxygen, biochemical oxygen demand, ammonia, nitrate, and turbidity—and in streamflow toward either improvement or deterioration are appraised at selected sites within the river system.

The quality of streams in the upper Passaic River basin in northeastern New Jersey is shown to be deteriorating with time. For example, biochemical oxygen demand, an indirect measure of organic matter in a stream, is increasing at most stream-quality sampling sites. Similarly, the dissolved-solids content, a measure of inorganic matter, also is increasing (fig. 1). These observations suggest that the Passaic River system is being used more and more as a medium for the disposal of industrial and municipal waste waters.

Dissolved oxygen, an essential ingredient for the natural purification of streams receiving waste discharges, is undersaturated (that is, below theoretical solubility levels) at all sampling sites and is decreasing with time at most sites. This is another indication of the general deterioration of stream quality in the upper basin. It also indicates that the ability of the river system to receive, transport, and assimilate wastes, although exceeded now only for short periods during the summer months, may be exceeded more continually in the future if present trends hold.

Decreasing ratios of ammonia to nitrate in a downstream direction on the main stem Passaic River suggests that nitrification (the biochemical conversion of ammonia to nitrate) as well as microbiological decomposition of organic matter (waste waters) is contributing to the continued and increasing undersaturation of dissolved oxygen in the river system.

Passaic River streams are grouped into five general regions of isochemical quality on the basis of predominant constituents and dissolved-solids content during low flows. The predominant cations in all but one region are calcium and magnesium (exceeding 50 percent of total cations); in that region, where man's activities probably have altered the natural stream waters, the percentage of sodium and potassium equals that of calcium and magnesium. In two of the five regions, the predominant anion is bicarbonate; a combination of sulfate, chloride, and nitrate is predominant in the other three regions. Dissolved-solids content during low flows generally ranges from 100 to 600 milligrams per liter.

Several time-of-travel measurements within the basin are reported. These data provide reasonable estimates of the time required for soluble contaminants to pass through particular parts of the river system. For example, the peak concentration of a contaminant injected into the river system at Chatham during extreme low flow would be expected to travel to Little Falls, about 31 miles, in about 13 days; but at medium flow, in about 5 days.

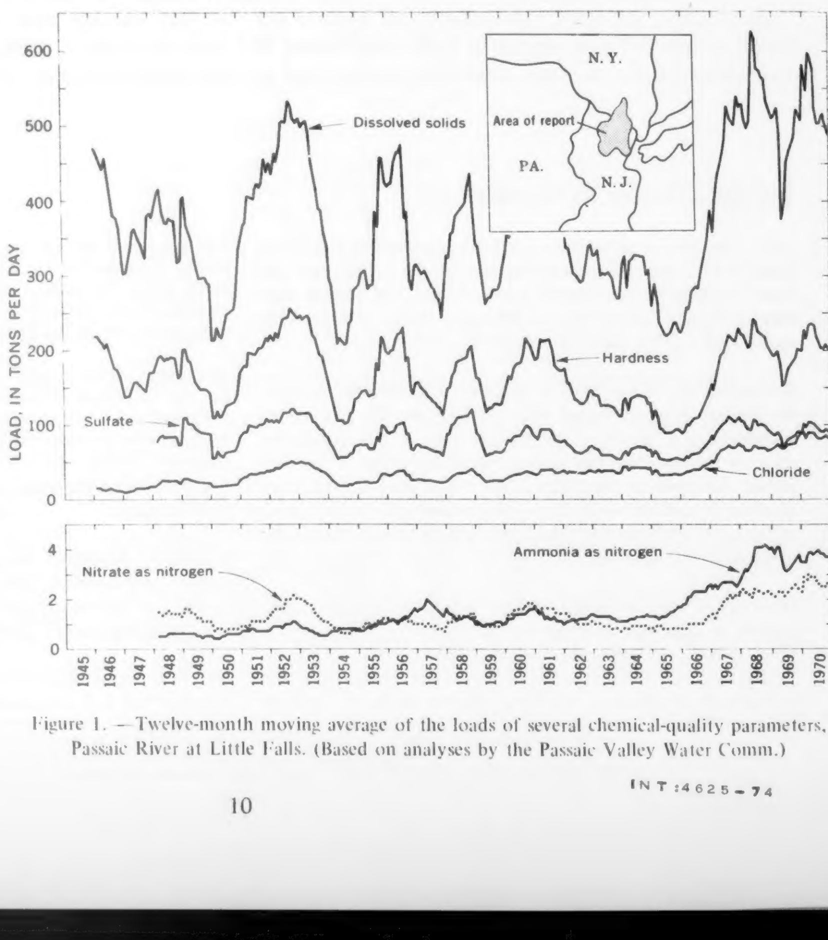

Figure 1. —Twelve-month moving average of the loads of several chemical-quality parameters, Passaic River at Little Falls. (Based on analyses by the Passaic Valley Water Comm.)